ACCESSION #: 9606180051

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Limerick Generating Station, Unit 2 PAGE: 1 OF 5

DOCKET NUMBER: 05000353

TITLE: Reactor SCRAM Resulting From a Main Generator Lockout due

to the Actuation of a Voltz/Hertz Relay caused by an

Inadequate Design Change Package.

EVENT DATE: 05/14/96 LER #: 96-004-0 REPORT DATE: 06/12/96

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: J. L. Kantner - Manager, Experience TELEPHONE: (610) 718-3400

Assessment

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:

REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At 1033 hours on 05/14/96, Unit 2 experienced a Main Generator lockout due to the inappropriate actuation of the volts/hertz relay 359/381A. The Main Generator lockout relay 386B caused a Main Turbine trip and subsequent automatic reactor SCRAM due to a Main Turbine control valve fast closure Reactor Protection System actuation signal. Also, various Engineered Safety Feature actuations occurred as a result of this event. All

control rods fully inserted as designed, and Operations personnel successfully controlled plant shutdown using appropriate station procedures. No Emergency Core Cooling Systems initiated following the unit SCRAM. Following recovery from the SCRAM the unit was taken critical on 05/15/96, at 0932 hours. The cause was attributed to an inadequate Design Change Package (DCP) implemented in 1988, which failed to update a specific relay drawing. The volts/hertz relay 359/381A should have been set to trip at 24,240 volts at 60 hertz, but was incorrectly set to trip at 22,680 volts at 60 hertz. Relay 359/381A was recalibrated to the correct setpoint. Other similar relays were inspected and determined to be unaffected by the DCP. Further investigation is in progress, and any significant findings will be reported in a supplement to this report.

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Unit Conditions Prior to the Event:

Unit 2 was in Operational Condition 1 (Power Operation) at 100% power

level.

Prior to this event, the Pennsylvania, New Jersey, and Maryland (PJM)

grid was experiencing instabilities due to equipment problems. At 1009

hours on May 14, 1996, all lines and transformers at the Delmarva Keeney

500KV Substation in Delaware tripped, resulting in a reduction in grid

voltage. The load dispatcher (LD) requested that the Limerick Generating

Station (LGS) Unit 2 pick up additional reactive load to help stabilize

the grid. At 1026 hours the Delmarva Keeney 500KV Substation was

restored which resulted in an increase in grid voltage due to switching

of bulk power capacitors. At 1030 hours on May 14, 1996, the LGS Main

Control Room (MCR) Operations personnel again increased reactive load at

the LD's request.

Description of the Event:

At 1033 hours on May 14, 1996, Unit 2 experienced a Main Generator

(EIIS:TG) lockout due to the actuation of the volts/hertz relay (EIIS:RLY) 359/381A. The Main Generator lockout relay 386B caused a Main Turbine (EIIS:TRB) trip and subsequent automatic reactor SCRAM due to a Main Turbine control valve fast closure Reactor Protection System (RPS, EIIS:JC) actuation signal. No Emergency Core Cooling Systems initiated nor were required to initiate following the unit SCRAM.

The Transient Response Implementation Plan (TRIP) procedures T-101, "RPV Control," and T-99, "Post SCRAM Restoration," were executed by MCR operations personnel following the reactor SCRAM. The reactor shutdown was accomplished with no abnormalities. All control rods fully inserted following the reactor SCRAM. Reactor coolant level decreased approximately three inches and was restored to normal using the feedwater system. General Plant (GP) procedure GP-3, "Normal Plant Shutdown," was executed to continue with normal shutdown activities. Procedure GP-8, "Primary and Secondary Containment Isolation Verification and Reset" was executed to reset the affected Primary Containment and Reactor Vessel Isolation Control System (PCRVICS, EIIS:JM) isolation signals, Engineered Safety Feature (ESF) actuations. Following recovery from the SCRAM and a review of the event, Unit 2 was taken critical on May 15, 1996, at 0932 hours.

A four hour notification was made to the NRC at 1244 hours, on May 14, 1996, in accordance with the requirements of 10CFR50.72(b)(2)(ii), since

this event resulted in automatic actuations of the RPS and ESFs. This LER is being submitted in accordance with the requirements of 10CFR50.73(a)(2)(iv).

Analysis of the Event:

The reactor SCRAM occurred automatically and all control rods fully inserted as designed. MCR Operations personnel successfully controlled shutdown of the plant using the appropriate station procedures. The actuation of the PCRVICS functioned as designed, and there was no release of radioactive materials to the environment as a result of this event.

The 4KV Safeguard Buses, the Emergency Diesel Generators (EDG, EIIS:EK), and the two offsite electrical sources were operable throughout the event to provide power to assure safe shutdown capability.

The Main Generator volts/hertz relay 359/381A actuated at approximately 22,680 volts at the Main Generator terminal with a frequency of about 60 hertz. The 359/381A relay should have been set to trip at approximately 24,240, volts at 60 hertz after a 45 second time delay. The volts/hertz protective relay 359/381A actuated at an inappropriately low value. The PJM grid instabilities that were in progress at the time of the trip caused grid voltage to be elevated; however, the inappropriate relay setting was the cause of the Main Generator lockout. The PJM grid instabilities that were present prior to this event were not responsible for the Main Generator lockout. Once the volts/hertz relay actuated, the Main Generator lockout, Main Turbine trip, and reactor SCRAM occurred as

designed.

Cause of the Event:

The cause of the event was attributed to an inadequate Design Change Package (DCP) implemented in 1988, which failed to update a specific calculation. The cause of the Main Generator lockout, Main Turbine trip, and reactor SCRAM was due to the inappropriate actuation of the volts/hertz relay 359/381A. The relay should have been set to trip at 24,240 volts at 60 hertz, but actually tripped at 22,680 volts at 60 hertz resulting from the inadequate DCP.

An investigation revealed that a design change made in 1988, changed the volts/hertz sensing potential transformer (PT) from a 208:1 PT to a 200:1 PT. The design change (i.e., DCP-2077), failed to update Drawing E-99, "Electrical Protective Relay Index." Drawing E-99 uses the PT ratio to calculate the relay settings. As a result, the calculation was based on an incorrect 208:1 PT ratio, and this introduced a 3.8% setpoint error in the low direction. In addition, the as-found relay calibration indicated that the setpoint had drifted 2.6% in the low direction. The combination of the calculation error and drift caused the inappropriate relay actuation. An interim Engineering evaluation has determined that the as-found drift is typical for this type of relay and is not excessive.

Corrective Actions:

The following corrective actions have been taken:

1. Relay 359/381A was recalibrated to the correct setpoint using an Engineering Change Request (i.e., ECR LG 96-02018).

2. Drawing E-99 was corrected in accordance with ECR LG 96-02018.

3. Other similar relays were inspected to determine if these relays were impacted by DCP-2077. There were no other relays impacted by the subject DCP.

4. The Main Generator voltage regulator setup procedure (i.e., IC-C-11-02063, "Testing and Calibration of the Alterex Excitation System") was reviewed to determine if the regulation was set up using the correct PT rating. The set up procedure was verified correct for Unit 1 and Unit 2.

5. The Unit 2 volts/hertz relay 359/381B (two second time delay trip) and relay 359/381C (alarm relay) were calibration checked for possible drift. Relay 359/381C was found in tolerance. Relay 359/381B was found 1.8% low, and was recalibrated within tolerance.

6. Calibration records were reviewed for the Unit 1 Main Generator volts/hertz relays to determine when the relays were last calibrated. The Unit 1 relays were calibrated in February 1996 during the sixth Unit 1 refueling outage.

7. The Main Generator volts/hertz relay calculations for Unit 1 relays 359/381A, B, C and the Unit 2 volts/hertz relays 359/381B, C were inspected and verified to be correct.

An investigation is in progress to determine why DCP-2077 failed to update Drawing E-99. This investigation will evaluate any potential generic implications. The results of this investigation along with any additional corrective actions will be provided to the NRC Resident Inspector. A supplement to this report will be provided if any significant findings are identified from this investigation.

Previous Similar Occurrences:

LGS LER 2-89-013 reported a reactor SCRAM that occurred due to a Main Generator lockout. The cause of the event was a design error in the calculation of the Main Generator differential current relay trip setpoint. The error caused the premature operation of the relay. The investigation stated above will review this event for similarities.

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10CFR 50.73

June 12, 1996

Docket No. 50-353

License No. NPF-85

U.S. Nuclear Regulatory Commission

Attn: Document Control Desk

Washington, DC 20555

SUBJECT: Licensee Event Report

Limerick Generating Station Unit 2

This LER reports a Unit 2 reactor SCRAM, an automatic Reactor Protection System actuation, resulting from a Main Generator lockout due to the actuation of a volts/hertz relay. The Main Generator lockout caused a Main Turbine trip and various Engineered Safety Feature actuations. No Emergency Core Cooling Systems initiated as a result of this event. The cause was attributed to an inadequate Design Change Package implemented in 1988, which failed to update a specific relay drawing.

Reference: Docket No. 50-353

Report Number: 2-96-004

Revision Number: 00

Event Date: May 14, 1996

Report Date: June 12, 1996

Facility: Limerick Generating Station

P.O. Box 2300, Sanatoga, PA 19464-2300

This LER is being submitted pursuant to the requirements of 10 CFR 50.73 (a) (2) (iv).

Very truly yours,

cc: T. T. Martin, Administrator Region I, USNRC

N. S. Perry, USNRC Senior Resident Inspector, LGS

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